

# SEAFDEC Asian Aquaculture



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The Southeast Asian Fisheries Development Center (**SEAFDEC**) is a regional treaty organization established in December 1967 for the purpose of promoting fisheries development in Southeast Asia. Its Member-Countries are Japan, Malaysia, the Philippines, Singapore, Thailand, Brunei Darussalam, the Socialist Republic of Viet Nam, Union of Myanmar, and Indonesia. Four departments were established in the Member-Countries; one of them, the Aquaculture Department (**AQD**) located in the Philippines, pursues aquaculture research and development

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### Contributions

We accept articles that focus on issues, developments, and information on all phases of sustainable aquaculture for publication in this newsletter. Photographs and line drawings must be camera-ready, glossy B&W prints or colored slides. The newsletter editor reserves the right to edit contributed articles for brevity and style.

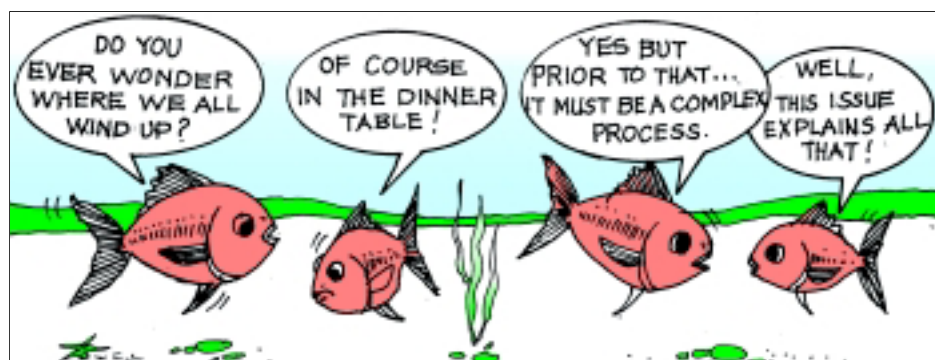
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## OUR COVER

*Depicts the journey made by a fish product from harvest, through middlepersons -- fish broker, retailers -- and finally to a household or restaurant*  
ILLUSTRATION BY AP SURTIDA



**Consistent harvest:** AQD tested high stocking densities of tiger shrimp (25-40 per m<sup>2</sup>) in ponds less than 1 ha. AQD Chief Dr. Rolando Platon (lower photo) explained to the Iloilo media and the invited shrimp farmers the new scheme and its profits

## **Profit for the shrimp farmer, profit for the environment**

SEAFDEC/AQD has indeed good news for tiger shrimp growers. A new culture system, an environment-friendly scheme, that AQD has been verifying yielded consistent bumper harvests. Results of three consecutive runs gave a total net profit of almost P1.7 million.

The runs were conducted at AQD's Brackishwater Station in Dumangas, north of Iloilo City. Tiger shrimp were stocked at 25 per m<sup>2</sup> in the first two runs and at 40 per m<sup>2</sup> in the third. About 15 tons of shrimp were harvested from the three ponds that have average areas of 0.8 ha. Average survival rate was noted as 77%.

The shrimp industry, once dubbed as the sunshine industry because of its huge profits, suffered serious setbacks brought about by the deadly luminous bacteria. This left the shrimp industry virtually dead in the eighties.

AQD finally came up with a scheme that will profit both the shrimp farmer and the environment. The scheme uses a reservoir where fishes are stocked to produce greenwater. Only water coming from the reservoir is used in the grow-out pond.

Long-arm paddle wheels is also used in the scheme, improving aeration and spinning the water around the sludge collector installed at the center. This sludge collector is basically a net enclosure where tilapia are stocked. The net minimizes the contact of shrimp with pond sludge, while tilapia reduce the organic matter in the pond. Tilapia fed on the plankton that bloom with increased nutrients as culture progressed.

After a run, water from the grow-out pond is allowed to settle in the sedimentation pond before it is discharged to the sea. And because the culture is chemical-free, the effluent does not harm the environment.

This new method of shrimp farming is now being disseminated through the Joint Mission of AQD and the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) using the latter's demonstration and training facilities throughout the country.

## **Technology caravan**

SEAFDEC/AQD joined the government sponsored *Fisheries Technology Caravan* held in seven regions from September 19 to October 23. The caravan began in Quezon City, travelled through regions 4 and 5 (Luzon), 8 (Visayas), 9, 10, 12 and 13 (Mindanao), and ended in Nasugbu, Batangas. The month-long activity was aimed at sharing the latest technology breakthroughs with the aquaculture sector. Lectures and demonstration were conducted

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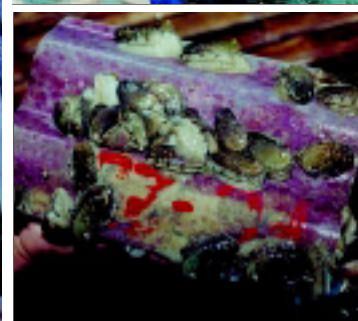
*Agriculture Secretary Edgardo Angara (right) presents a certificate of appreciation to Dr. Platon for AQD's support of the government aquaculture program. The party of Mr. Angara later visited the government fish farms where AQD is demonstrating its shrimp technologies*



## Community abalone culture

Efforts by SEAFDEC/AQD are underway to field-test abalone farming in coastal communities. This tiny rock of an island off the western coast of Panay island, west central Philippines, is the site of a research project on abalone cage culture, a collaboration with a small-scale fishermen's multi-purpose cooperative.

AQD researcher Armando Fermin, the project in-charge, recently monitored the growth of abalone in the area (photos on the right). "The abalone appear to be thriving well," he said. "These stock were spawned and reared in AQD's hatcheries."



by AQD, BFAR, and the Philippine Council for Aquatic Management and Research Development.

Dr. Platon during the opening ceremonies in Batangas clarified an issue that SEAFDEC caters only to the rich. "SEAFDEC has developed technologies for both the rich and the poor. In fact there are aquaculture technologies that have already been adopted by the small-scale fisherfolk like the culture of oyster and mussel, tilapia, and seaweeds, among others," he said. Dr. Platon mentioned that SEAFDEC scientists are happy to have joined the caravan. He also assured BFAR of AQD's support for their programs.

In the same activity, AQD was commended by the Philippine government for its support to aquaculture programs.

☞ ONE MORE STORY ON PAGE 6



## AQD Research Publications

Reprints of papers listed here may be requested directly from AQD authors or from the AQD Library

Compiled by the **AQD LIBRARY** <library@aqd.seafdec.org.ph>

Moriyama S, **Ayson FG**, Kawauchi H. 2000. Growth regulation by insulin-like growth factor-I in fish. *Biotechnology & Biochemistry* 64 (8): 1553-1562

**Abstract.** Insulin-like growth factor-I (IGF-I) is a mitogenic polypeptide that plays an essential role in the regulation of development and somatic growth of vertebrates, mainly by mediating growth hormone actions. It has clearly been established that the structure of IGF-I and its biological function has been highly conserved among vertebrates. In this paper, we review the recent developments in the molecular, biochemical, and physiological properties of IGF-I in fish.

Estudillo CB, **Duray MN**, Marasigan ET, **Emata AC**. 2000. Salinity tolerance of larvae of the mangrove red snapper (*Lutjanus argentimaculatus*) during ontogeny. *Aquaculture* 190 (1-2): 155-167

**Abstract.** Salinity tolerance and the effects of salinity on growth, condition factor and chloride cell (CC) densities were evaluated for *Lutjanus argentimaculatus* larvae during ontogeny. Tolerance of *L. argentimaculatus* larvae to abrupt changes of salinity from 32 ppt varied with age. Periods to 50% mortality ( $LT_{50}$ ) were significantly ( $P < 0.05$ ) longer for 0-day-old larvae than for 7-, 14- and 21-day-old larvae. Tolerance of abrupt salinity change increased remarkably, starting on day 28. Although abrupt transfer to test salinities caused substantial mortalities, *L. argentimaculatus* larvae, regardless of age (0-, 7-, 14-day-old), showed significantly longer  $LT_{50}$  when abruptly transferred to 8 and 16 ppt than for transfers to 24 and 40 ppt ( $P < 0.05$ ). Growth of *L. argentimaculatus* larvae at 16, 24, 32 (control) and 40 ppt was not significantly different either at the end of the first rearing phase (days 0-21) or second phase of rearing (days 22-50). Survival was significantly lowest at 40 ppt (4.3%) at the end of first phase of rearing ( $P < 0.05$ ). Then were no significant differences in survival rates at the end of the second phase of rearing; however, the condition factor (K) of larvae reared at lower salinities was significantly higher than that of fish at 40 ppt ( $P < 0.05$ ). Gill epithelia of 42- and 50-day-old larvae showed increasing density of CC with increasing salinity.

**Gallardo WG**, Hagiwara A, Snell TW. 2000. GABA enhances reproduction of the rotifer *Brachionus plicatilis* Muller: application to mass culture. *Aquaculture Research* 31 (8-9): 713-718

**Abstract.** Based on the results of individual and batch culture experiments in small volumes, we conducted experiments in

larger volumes of 100 mL, 1 L and 10 L to determine: (1) at what phase of population growth would gamma-aminobutyric acid (GABA) treatment be most effective; and (2) whether GABA treatment of concentrated rotifers for several hours before mass culture would also be effective. GABA treatment of rotifer culture at lag phase significantly enhanced population growth, whereas treatment at log phase had a lesser effect, and treatment at stationary phase had no effect. Addition of GABA to rotifer cultures every 2 days hastened population growth until day 8, but resulted in culture collapse thereafter. To reduce the cost of the use of GABA in mass cultures, GABA treatment may be conducted on concentrated rotifers (100 individuals  $mL^{-1}$ ) before mass culture. GABA treatment of concentrated rotifers for 24 h and 48 h before mass culture resulted in a significantly higher population density compared with their respective controls (no GABA treatment) on day 4, and on days 4 and 6 respectively.

**Lebata JHL**. 2000. Elemental sulfur in the gills of the mangrove mud clam *Anodonta edentula* (Family Lucinidae). *Journal of Shellfish Research* 19 (1): 241-245

**Abstract.** Different sizes of the mangrove mud clam *Anodonta edentula* were collected from the mangroves in Bgy. San Rogue in Estancia, Iloilo, central Philippines, and the mantle, gill, and foot tissues were analyzed for elemental sulfur content. Mangrove mud (substrate) was also analyzed for total sulfur content to establish the possibility of clam-bacteria symbiosis in this lucinid clam. Sulfur analysis showed highly significant ( $P < 0.0001$ ) amounts of elemental sulfur in the gills (247.64  $\pm$  63.28  $\mu$  moles/g FW) compared with the quantities observed in the mantle (0.84  $\pm$  0.22  $\mu$  moles/g FW). Elemental sulfur was absent from the foot tissues. Results also showed a significantly ( $P < 0.05$ ) decreasing elemental sulfur from the newly collected clams (mean = 461.18  $\mu$  moles/g FW) compared to those reared in the laboratory (mean = 159.08  $\mu$  moles/g FW with mangrove mud substrate; mean = 45.18  $\mu$  moles/g FW without substrate), which were analyzed weekly until week 3, indicating that stored elemental sulfur is being utilized by the bacteria in the absence of sulfide. Total sulfur content of mangrove mud *in situ* was higher than that used as substrate in the experiment; where there were no significant differences from initial to final readings. This shows that mangrove mud *in situ* is linked to a steady sulfur source.

**Eguia RV**, Kamarudin MS, **Santiago CB**. 2000. Growth and sur-

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vival of river catfish *Mystus nemurus* (Cuvier & Valenciennes) larvae fed isocaloric diets with different protein levels during weaning. *Journal of Applied Ichthyology* 16 (3): 104-109

**Abstract.** The growth of river catfish *Mystus nemurus* (Cuvier & Valenciennes) larvae fed four isocaloric diets (4200 kcal kg<sup>-1</sup>) with different protein levels during weaning was determined. Diets containing 45, 50, 55, and 60% protein were formulated by linear programming using amino acid profiles based on that of 2-day-old river catfish larvae. Artificial diets were fed to the larvae beginning at day 5 after being initially fed *Artemia* nauplii for 4 days. The larvae thrived solely on artificial diets from day 8 to day 16. On the other hand, the control larvae were fed *Artemia* nauplii from day 1 to day 16. Results of the feeding trial showed that growth and survival of *M. nemurus* larvae given the diet containing 60% protein were high and comparable to those of the

larvae given only live food (control). Larvae fed the 55% protein diet had significantly lower growth and survival than the larvae on the control and 60% diets but significantly higher growth and survival rates than did larvae fed with 45 and 50% protein diets. Carcass moisture and total lipids after 16 days of feeding did not differ significantly ( $P>0.05$ ), but body protein increased with increasing dietary protein. Body protein of the control larvae was similar to that of larvae given the 60% protein diet.

ABSTRACTS FROM JOURNALS COVERED BY CURRENT CONTENTS ARE DOWNLOADED FROM THE CD-ROM VERSION (AGRICULTURE, BIOLOGY & ENVIRONMENTAL SCIENCES; 1 NOVEMBER 1999 - 23 OCTOBER 2000). 2000. INSTITUTE FOR SCIENTIFIC INFORMATION, PENNSYLVANIA, USA

#### AQD NEWS . . . FROM PAGE 4

### Training on responsible aquaculture

Fourteen trainees from Asia and Africa recently graduated from SEAFDEC/AQD's *Third-Country Training Programme on Responsible Aquaculture Development*.

The two-month course aimed to intensify the dissemination of responsible and sustainable aquaculture technology. The conceptual framework of responsible aquaculture development is to develop culture techniques that are economically viable, environment-friendly, and involving approaches to coastal resources management that protect and conserve the resources as well as ensure equitable sharing of resource benefits by stakeholders.

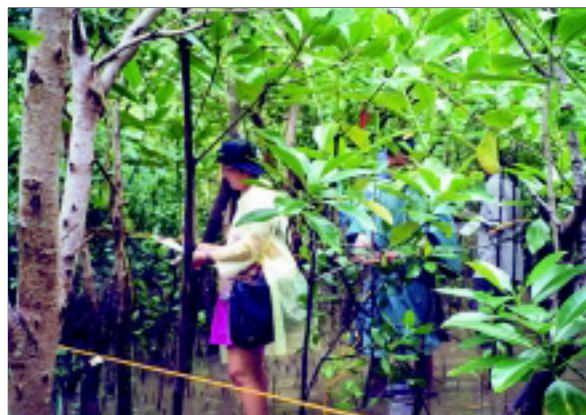
The curriculum consisted of 30 % lectures and 70% practical laboratory/demonstrations, oral presentations, written exams and field trips.

The major subjects covered included: coastal resource management and coastal aquaculture. The latter consisted of: seed production, brackishwater pond culture, fish health management, nutrition and feed development, seaweed culture, mollusc/shellfish culture, pen cage culture, and mangrove friendly aquaculture.

The fourteen trainees who graduated on October 27 were from Bangladesh, Cambodia, China, India, Indonesia, Kenya, Myanmar, Nigeria, Pakistan, South Africa, Sri Lanka, Tanzania and two participants from the Philippines.

Sponsors of the training program were the Government of the Philippines as represented by the National Economic and Development Authority (NEDA), SEAFDEC/AQD (lead implementor of the project), and the Government of Japan thru the Japanese International Cooperation Agency (JICA).

— AQD NEWS BY ET ALDON AND AP SURTIDA



*Practicals are a big part of the training course on responsible aquaculture. Trainees assessed and reported on mangrove resources (above and right). They also went through actual aquaculture activities like pond stocking below*



# Human factors in the development and transfer of improved aquaculture technology

**GIDEON P. CARNAJE, PhD**

Assistant Professor of Economics  
University of the Philippines - Visayas  
Miag-ao, Iloilo

With a view of ensuring an adequate supply of fry and thereby enhancing sustainability of aquaculture, many agencies here and abroad have undertaken researches on captive breeding and mass fry production of various species. But there remain obstacles -- technical, market, and institutional -- which make the broodstock-hatchery technology quite risky to adopt.

The moral of this situation appears to be that technological change cannot take place in a "cultural vacuum." Success in the development and transfer of improved aquaculture technology will often be determined by how well technology designers have taken into account the social and behavioral context in which the technology will be applied. This insight is not new. Fishery biological scientists generally recognize the fact that new technology must be socially and economically relevant, but the 20-20 hindsight of social scientists has left them skeptical. Biological scientists view social scientists as after-the-fact critics who study and report cases where technology designers have gone wrong in social, cultural, or economic terms. The description and explanation of events that are over and done with is important. But knowledge of social dynamics is not very relevant unless it plays a crucial role during technology development stages.



*SEAFDEC/AQD's demonstration complex for fish hatchery technologies: convincing farmers of technical viability*

## *Choice and design of technology*

The international research centers are now fully aware of the importance of considering "appropriate" technologies.<sup>1</sup> But what may appear appropriate from a scientist's viewpoint may not necessarily appear so to the target user. When the user's viewpoint is not known to, or considered by, the project designer, the project is vulnerable to the risk that the intended beneficiaries

may end up not using its services or technologies. In cases where the technical aspects of such technologies are not very complicated, it is often a range of user-related issues that need most attention during design—for example, the beneficiaries' access to time, money, land, or other indispensable resources, or the existence of undesirable practices, beliefs, or similar obstacles. In particular, project designers should focus on users rather than on technological inputs alone; consider what other technologies, skills, behavior patterns, or resources exist or are required to ensure that access to technology will be followed by its actual use; and adapt the technology to the user characteristics and build education components or incentives into the project.

Choosing a socially appropriate technology therefore requires three steps: (1) specify the social, behavioral, and resource requirements of the technology; (2) assess the corresponding characteristics of the target beneficiaries and their environment; and (3) compare both types of information to verify that the technology and the target users are compatible.

<sup>1</sup> This section draws on Perret and Lethem (1980)

Such cross-checking can be especially helpful not only in defining and ensuring the user's willingness to pay, but also in choosing among different technological options, in deciding location questions, and in identifying areas for cutting technology costs and small details that need to be altered to improve acceptance or use.

A close linkage between technology decisions and social information requires a timely and ongoing dialogue between technical, economics and social specialists, or access to technical specialists who are intimately familiar with relevant social aspects of the problem. Frequently, however, the social side of project work has continued in isolation from project technology decision-making.

#### *Role of social scientists*

Social scientists are examples of what has been called "liminal personae" -- they are "betwixt and between"—coming from the society and culture of scientists but often identifying with or focusing on the needs and goals of those they study. The role of the social scientists in technology development settings is to act as a *cultural broker* between farmers and technology designers. This is made most clear in the work of Rhoades and Booth (1982) who illustrated the means by which "acceptable agricultural technology" can be generated. In their farmer-back-to-farmer model, social scientists gain understanding of the farmer's perspective and needs, then communicate these to scientists who use the findings to design better, more appropriate technology. Under ideal circumstances, the technology is tested and adapted on-farm. Social scientists observe the reactions of farmers and communicate these evaluations back to the research scientists at which point the cycle can begin again.

In the implementation of the farmer-back-to-farmer model, social science provides an important service to both the farmer and the scientist by brokering the communication between them. This service-oriented research, however, is only part of what social science has to offer. There is a need for involvement of the social sciences, not only as a service-oriented appendage of biological research programs, but as leaders in the identification of technologies and policies that will help implement positive programs and to mitigate some of the potential negative consequences of the spread of new technology. This involvement comes under the rubric of what De Walt (1988:345) calls social science of agriculture... "the study of interaction of the natural environment, sociocultural patterns, market conditions, government policy, and

technological systems in order to identify agricultural research and/or extension priorities, to determine appropriate institutional structures and responsibilities for research and extension, to predict economic, social, and cultural consequences of agricultural change, and to identify government, agency and institutional policies that will facilitate development of more just and equitable social systems."

#### *Things to do*

The factors relating directly to the fish farmer, his family, and his community must be considered if the full effects of aquaculture research are to be realized. In particular, there is a need to document cases showing the strengths and weaknesses of social sciences for interdisciplinary work in developing fish production technology and then to establish a framework for generating more effective and creative interactions between social scientists and fishery biological scientists.

Social scientists often express hurt and disappointment when their expertise and efforts are not given due recognition. Their task, they tell each other, is huge, diffuse, and complex; those who fail to appreciate their work must lack the ability to see that complexity. What they don't say is that their unwillingness or inability to argue their case clearly has sown the seed of misunderstanding. Social scientists need to be able to speak the language of both the scientists and the people on whom development efforts are focused.

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## BOOK REVIEWS

### Mangroves & aquaculture, Encyclopedia of aquafarming, Shrimp culture



**Mangrove-Friendly Aquaculture.** 2000. Proceedings of the first workshop on mangrove-friendly aquaculture held in 1999; organized by SEAFDEC Aquaculture Department. Edited by: JH Primavera, LMaB Garcia, MT Castaños, and MB Surtida. 220 p

SEAFDEC/AQD continues to work on community aquaculture in the context of sustainable coastal resources management. This work is

documented in the proceedings and other activities focused on environment-friendly shrimp farming, a major dollar earner for SEAFDEC Member Countries. But discharges from shrimp farms continue to be a threat to both the mangrove and marine ecosystems, with a negative effect on the livelihood of the coastal poor. It is thus not surprising that interest has been generated in the entire southeast Asian region to work together and find ways to make shrimp farming kind to the environment, particularly the mangrove ecosystem.

The proceedings has three review papers on the mangroves of Southeast Asia, silvofisheries, and Indonesia's integrated mangrove forest and aquaculture systems.

The rest of the papers, all on mangrove-friendly aquaculture efforts are from the Philippines, Japan, Thailand, Vietnam, Malaysia, Brunei Darussalam, Indonesia, and Cambodia. All the countries represented had varied methodologies, with Cambodia in its initial stages while some countries like Indonesia and Thailand have tested methodologies. But even so, most countries report that they would benefit from experiences of other countries.

The proceedings include a tabulation of the reported mangrove-friendly technology by country -- e.g. silvofisheries in ponds (mangrove and fish/shrimp/mudcrab) and pens (mangrove and mudcrab). The workshop recommendations are classified into three major topics: problems associated with mangroves, problems associated with aquaculture practices, and socioeconomic and cultural issues.

For more information on SEAFDEC/AQD's mangrove-friendly aquaculture program and/or environment-friendly shrimp culture program, contact <aqdchief@aqd.seafdec.org.ph>.

For book orders, write <sales@aqd.seafdec.org.ph>

**Encyclopedia of Aquaculture.** 2000. Edited by: Robert Stickney. Wiley and Sons, Inc. Canada. 1063 p

Aquaculture is much discussed these days, whether in the context of food production or in developing and planning environmental matters. But discussions are marred by misunderstandings of various terms used. Perhaps, the editor suggests, that this must be the reason why the public image of aquaculture is not always favorable.

This *Encyclopedia of Aquaculture* will assist scientists, economists, sociologists, administrators, and politicians who are directly or indirectly involved in aquaculture. Added to this, the book would also provide information to those in the general public who consume aquaculture products, engaged in recreational activities such as aquarium fishes or those who are concerned with animal welfare.

The encyclopedia has many photographs and pen and ink illustrations to further enhance understanding.



**Sustainable shrimp culture technologies: use of probiotics and reservoirs with "greenwater."** 1999. Written by VL Corre Jr, R Janeo, C Caipang, and A Calpe. Published by DOST, UPV and FAO-UNDP

Shrimps are still export winners because of its high price in the world market. Despite the Philippines' shrimp crash in 1992 (47,776 ha in 1991 decreased to

39,658 ha culture area; shrimp processors from 53 in 1992 to 18 in 1995) the excellent market price continues to prod shrimp farmers to try out new culture methods, even if risks threaten investment. The newest entrant is probiotics: the "use of beneficial bacteria in the pond water that represses the growth of disease causing organisms through the production of inhibitory substances or by competition."

But probiotics users say that it is far from the sure-fire solution to the problems that affect the shrimp industry. One user said that he invested big on probiotics but the day-to-day anxiety about his stock being wiped out anytime still persists. Sometimes in desperation, shrimp farmers combine all methods known to them,

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After shrimp culture: the bottom of the pond applied with (left) or without probiotics (below; note the blackish, accumulated organic matter)



Professor Valeriano Corre of the University of the Philippines in the Visayas and a few of the probiotics products in the market



even combining antibiotics with probiotics to save their stocks. Perhaps only time will prove the efficacy of any one intervention being offered.

This review will present the highlights of the technology package of probiotics from a manual by Professor Valeriano Corre and his colleagues, jointly published by the Philippine government research center in Los Banos, Laguna; the University of the Philippines in the Visayas, Miag-ao, Iloilo; and the FAO-UNDP.

### Highlights of the technology

Preparing ponds for shrimp farms have to be strictly observed especially if culture is continuous. Before stocking, the authors advise that an initial dose of probiotics be applied. The calculations of the amount of probiotics can be found on the product labels. The authors further recommend a stocking density of 25 PL per m<sup>2</sup> for sustainability (PL 15-18). Stock must be constantly monitored and sampled to determine the amount of feed, health condition, and harvest readiness. During culture, they authors say, regular application of probiotics is required.

Costs and returns analysis show net profits of P628,302 per 5 ha per crop for traditional or extensive system, P243,957 per ha per crop for semi-intensive system, and P383,686 per ha per crop for intensive system. The return on investment for extensive is 138% (5 ha), 24% for semi-intensive (1 ha), and 27% for intensive (1 ha) systems.

[Appearance of trade names in this publication does not necessarily mean endorsement by SEAFDEC/AQD -- Ed.]



# People IN AQUACULTURE

The following are summaries of the on-going seminar series at SEAFDEC/AQD. The speakers are visiting scientists.



## Quality control in cultured fish

Professor Heisuki Nakagawa discussed his quality control studies in cultured fish on September 18 at SEAFDEC/AQD's main station in Iloilo. He focused on the problem of fat content of cultured fishes as compared to wild fish.

Prof. Nakagawa said that cultured fish is generally fatty, and because of excessive li-

pid accumulation, the deterioration of carcass quality is hastened, and therefore, shelf-life becomes shorter. This led him to study the reduction of lipid reserves in fish without growth retardation.

"The lipids accumulated in the muscle, liver, vertebra, and adipose tissue should be actively mobilized to energy in response to energy demands," he explained. Nutritional imbalance sometimes induces abnormal lipid metabolism, specifically, low lipolysis activity.

Lipolysis ability could be evaluated by starvation test, lipid/protein exhaustion rate, *in-vitro* lipolysis, lipolytic enzyme activity, and the nature of adipose tissue. Examples for enhancement of lipolysis activity were introduced in ayu (*Plecoglossus altivelis*), black sea bream (*Acanthopagrus schlegelii*) and red sea bream (*Pagrus major*).

Prof. Nakagawa also found that feed additives such as algae and catechin, as well as feeding regime, and water velocity in rearing ponds could improve the lipolysis ability of cultured fish.

Prof. Nakagawa is a graduate of Hiroshima (BS) and Tohoku (M.Sc. and Ph.D) Universities. He is presently a professor of Biochemistry at Hiroshima University's Faculty of Applied Biological Science, his position since 1982. -- AP Surtida

## Temperature-induced immunosuppression in experimental Epizootic Ulcerative Syndrome (EUS)

This seminar is part of a PhD dissertation. Dr. Elena Catap of the Natural Sciences Research Institute, University of the Philippines in Diliman, Quezon City says that EUS outbreaks have been consistently associated with decreasing and fluctuating water temperatures. Dr. Catap's study investigated the role of temperature on the pathogenesis of EUS.



She presented an initial model of the sequential pathology of EUS from the infection of three-spot gourami (*Trichogaster trichopterus*) and sand whiting (*Sillago ciliata*) with spores of the fungus *Aphanomyces invadans*. Results showed that either rapid or gradual temperature led to a marked delay in the formation of mycotic granulomas and there was very minimal inflammatory

cell infiltration with extensive tissue damage in temperature-stressed fish. The addition of fish oil in the diet, Dr. Catap said, failed to enhance the inflammatory response of the experimentally-infected fish.

The efficacy of yeast vulcan and levamisole were also tested as immunostimulators in *A. invadans*-infected fish subjected to low and decreasing temperatures. Results based on haematological and non-specific immune parameters showed that both yeast glucan and levamisole have the potential to ameliorate the suppression of immune response during periods of low temperature.

However, further studies are required to fully understand and optimize the effectiveness of such immunostimulators.

Dr. Catap has a BS degree in Fisheries and Masters degree in Biology from the University of the Philippines. Her Ph.D. degree was earned at the School of Aquaculture, Faculty of Science and Engineering, University of Tasmania, Australia. -- APS

## Intestinal nutrient transport: development and ecological implications

Dr. Ronaldo Ferraris earned his BS Marine Biology (cum laude) at Xavier University, Philippines in 1974; his MS Zoology, major in Nutrition, and PhD in Zoology major in Physiology at the University of Hawaii in 1977 and 1982, respectively. He was a former researcher at SEAFDEC/AQD.

His seminar was about his studies at the Department of Pharmacology and Physiology, New Jersey Medical School, in the US where he currently works as biomedical researcher.

Dr. Ferraris was primarily interested in the intestinal nutrient transport in rats. Later, he delved into aquaculture because of the research's ecological implications.

➡ NEXT PAGE



One study -- "Reduction of phosphate levels in effluents from trout aquaculture" -- is of particular relevance to aquaculture because it can be a novel strategy in regulating phosphates. High concentration levels of phosphorous (P) can cause algal blooms and eutrophication in natural bodies of water like lakes and rivers.

Dr. Ferraris found high P levels in a river in Idaho because the rainbow trout farms there empty their effluents (incl. urine and fecal matter) on the river. He theorized that the excessive P levels in the feces of trout was due to poor digestion, as only about 25% of the food was assimilated. Similarly, the high P concentration in trout urine was due to excess filtration and poor reabsorption. This line of reasoning was earlier suggested by Dr. Ferraris' study on nutrient transport in rats.

Dr. Ferraris' study is of two parts: the laboratory studies which aims to find P ion transporters in the trout's small intestine and kidney and to demonstrate regulation by dietary P and vitamin D. The second part -- effluent studies -- is aimed at determining the relative importance of intestinal and renal wastes by measuring P in the soluble particulate and settleable components in trout farm effluent. -- APS



### **Endocrine control of flounder metamorphosis**

Dr. Yasuo Inui studied fish physiology at the National Research Institute of Aquaculture in Mie, Japan in the mid-'80s to the '90s while he was still Director of the said institution.

Dr. Inui said that the pituitary-thyroid axis plays a major role in the process of metamorphosis in fishes. His studies clarified the mechanisms of action of

the thyroid hormone on the tissue or organ development of the Japanese flounder (*Paralichthys olivaceus*), which he described as an ideal fish model for the study of endocrine control of metamorphosis and early development of teleosts.

The Japanese flounder, he said, exhibits drastic changes in its external appearance such as migration of the right eye to the left side of the head, and elongation and subsequent shortening of the dorsal fin rays from larvae to juveniles. During this period, it also transforms from being a pelagic plankton feeder to a benthic carnivore and its mobility develops markedly. Dr. Inui's study ran for about 10 years.

Dr. Inui attended the Tokyo University of Fisheries for his BS degree and University of Tokyo for his MS and PhD degrees. He is currently on short-term assignment to SEAFDEC/AQD as fish health/fish physiology expert. -- APS

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## **FRESH FISH CATCH . . . FROM PAGE 20**

### **MARKET MONITOR**

**[www.msstate.edu/dept/crec/awmr0598.html](http://www.msstate.edu/dept/crec/awmr0598.html)**

**[//lama.kcc.hawaii.edu/praise/news/mktrpts.html](http://lama.kcc.hawaii.edu/praise/news/mktrpts.html)**

These web pages are just examples of the monitoring done by universities and non-profit organizations as part of their extension services. Both sites have data posted by Dr. Benedict Posadas, a prominent marine economist in the Philippines who is now connected with the Mississippi State University (benp@ext.msstate.edu). The extension services usually get information on commercial production, farm-gate values and prices; production and processing costs; foreign trade and domestic consumption; and product forms, sources, quantities and prices in domestic (meaning, U.S.) and foreign markets.

### **THE IDEA MARKETPLACE**

**<http://aquaculture.industrialgrain.com/index.html>**

This is an aquaculture discussion forum where postings range from "270 acres of shrimp farm in Mexico for sale" to "I'm a junior, and I'm in an aquaculture class, and we are starting to gather info, and I was wondering if anyone could send us info about raising trout."

Joining in may be hit-and-miss, that is, you may or may not get a response on your posting, but it is fun nonetheless!

###





## to the market we go

While most fishfarmers do not stick their hands on the actual distribution of their produce to consumers, they are usually attuned to market issues that influence their production. Some might even consider buying and selling as the purview of a different sector of the aquaculture industry. However, it might be useful to take a look at the marketing chain, the new market requirement of HACCP, and the online markets which can give a global presence to small scale operations.

We also included success stories in this issue -- those of a fishing community that exports seafood, a fisher, and local seafood restaurants.

All are essentially glimpses of the players in the marketplace. We hope the readers will find lessons from these voices.

## child's play?

*Women and children play significant roles in preparing (like shuckling clams) and bringing family produce to the market. Poor communities usually use whatever transport facilities are present, including the water buffalo. In contrast, most producers and traders in developed countries have an online (internet) presence and just deliver goods directly to consumers.*

# A village's link to the world market economy

By **Susana V. Siar, PhD**  
SEAFDEC/AQD Researcher

In a fishing village 15 km north of the city proper of Puerto Princesa, the porch or veranda functions as the market, a place where buyer and sellers of fishery products meet. Buyer here is in the singular, because there is only one reigning in that porch, the one fishers and their wives call their *amo*. This buyer is known in the literature as a middleman, or as I prefer to call them, a middleperson, because many are women. Armed with a calculator, sheets of lined paper, and cash, she sits on her desk and takes notes as each fisher or family member weighs their day's catch of octopus, cuttlefish, stonefish, abalone, or fish. This scene is repeated daily in Aplaya, a fishing village along the coast of Honda Bay in Palawan. The middleperson links the village with seafood exporters in the city and Manila, who in turn are connected with the markets in Hong Kong, Singapore, the United States, and other parts of the world.

## A place called Aplaya

In the beginning there was no place called Aplaya. What existed was an *aplaya*, that is, a beach or seashore. In Tagalog, the word is a generic term and in every coastal municipality one is likely to find a place referred to as *aplaya*. It connotes both location

and direction. In local government records, Aplaya does not officially exist because it is known as Purok Silangan, one of the seven districts comprising Barangay Tagburos. The people in the barangay as well as the villagers refer to the place as Aplaya.

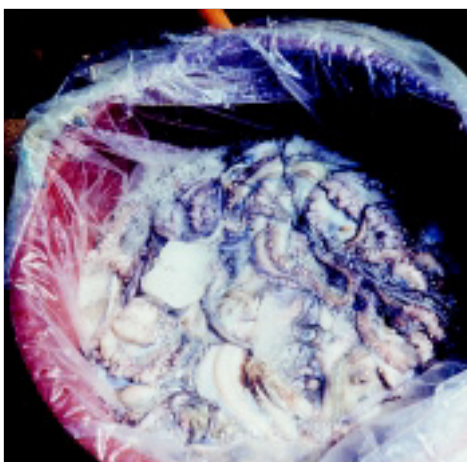
The creation of Aplaya is not a singular phenomenon. Many places in Palawan province have been made as a result of the movement and migration of people from within the province as well as from the outside. First came the boatload of workers from Mindanao who visited regularly to gather mangrove bark. Then came fishing families from Bohol who were looking for richer fishing grounds. They were then followed by groups of workers who were hired to gather mangrove wood for fuel. Finally, a group of workers was hired to convert the mangroves into fishponds. The origins of the present-day Aplaya may be traced to these last three waves of migration.

## Market and social relations

Many of the fishery resources gathered by the men, women, and children of Aplaya are destined for the export market. These include sea cucumber, abalone, octopus, cuttlefish, pufferfish, lobster, stonefish, and in the 1980s, live fish such as grouper and humphead wrasse. Some of these fishery resources do not have a history of use value in Aplaya such as sea cucumber, pufferfish, stonefish, and abalone. The villagers came to know about the exchange value of these resources through information provided by the middlepersons, who are involved in



**Sea cucumber.** In Palawan, sea cucumbers are one of the oldest fishery export commodities, together with pearls, mother-of-pearls, shells, turtle shells, and shark fins and tails. Women and children gather sea cucumber in the intertidal zone during low tide. Sea cucumbers undergo a process of gutting, boiling (as shown in the photo), and smoke-drying, tasks which are usually done by women



**Octopus.** Octopus emerged as an export commodity in Aplaya in the mid-1980s, at about the same time that the gathering and shipment of live fish was banned in Palawan. The villagers in Aplaya would rather sell an octopus than eat it, not because they do not like the taste, but because it is too expensive for them to eat



**Stonefish.** The stonefish is a very poisonous fish. It is caught and sold live to village buyers and seafood exporters. Women and children gathering shells and sea cucumbers are careful not to step on stonefish, but as one woman remarked, "People used to be afraid of the stonefish, now the stonefish are afraid of people."



almost all commercial transactions.

The relationship between the fishers or gatherers and the middleperson is practiced like a contractual agreement whereby the fisher or gatherer is obliged to sell his or her catch only to one middleperson with whom he or she has established a long-term relationship. Trust and reciprocity characterize this relationship. If the fisher or gatherer is expected to sell his or her catch to only one middleperson, the latter is obliged to provide cash advances and loans to the former, particularly during times of emergency. In Aplaya, one of the personifications of the middleperson is the *amo*.

### The *amo*-*tauhan* relationship

In Tagalog, *amo* literally means master, and *tauhan*, a person or persons under the service of another. In Aplaya, *amo* refers to a buyer of fishery products who finances the acquisition of boats and engines and to whom the fisherman and his family go to in times of need and emergency. Most of the *amo* in Aplaya are women who are themselves connected to seafood exporters based in Puerto Princesa City and Manila. These seafood exporters partly or fully finance the operation of the *amo* such as the acquisition of boats and engines for her *tauhan*. If the *amo* expects her *tauhan* to sell their catch to her, the seafood exporter also expects the same of the *amo*.

The *amo*-*tauhan* relationship carries with it certain obligations and responsibilities. During the lean fishing season of the northeast monsoon, the *tauhan*'s wife goes to the *amo* to borrow money, asks her to buy certain things for the fisher's family, or requests her to pay the installment for a home appliance. The amount borrowed will be listed as a debt which will be paid in small installments and may take a long time to be fully paid. When



**Pufferfish.** Like stonefish, pufferfish are also poisonous and do not have a history of use value in Aplaya. Unlike the other export commodities, the demand for pufferfish is intermittent, so when the buyer says that she would temporarily stop buying pufferfish, the fishers also stop fishing for them



**Abalone.** Abalone are caught by women and children when they gather sea cucumbers at night. One middleperson in Aplaya finances the diving of abalone in Balabac and Mangsee in southern Palawan. Above photo shows shells of shucked abalone

the fisher gets a good catch and sells it to the *amo*, the amount of the debt is not deducted from the sale as long as the *tauhan* continues to sell his catch to her. The *amo* does this so that the *tauhan* will be tied to her indefinitely and continue to sell his catch to her. However, the *tauhan* who is indebted to the *amo* gets a slightly lower price for his catch than others who do not owe a debt. The *amo*, knowing the economic circumstances of her *tauhan*, accepts the little installments that are being given to her in payment for the debt as long as she knows that the fisher or his family is not selling his catch to other buyers in the village. Not all fishers in the village are tied to an *amo*, however. Those who have their own boats generally sell their catch to whoever pays the higher price. However, if they are indebted to an *amo*, they are expected to sell their catch to this *amo*. For the *amo* to stay in business, her *tauhan* must be loyal to her.

The *amo*-*tauhan* relationship appears to be a symbiotic relationship as practiced in Aplaya. The village is near enough to the town center for villagers to have ready access to information on prices of fishery products in the marketplace. Many women are fish vendors who have permanent stalls in the marketplace and news about the decline or increase in fish prices travels fast. In the case of export commodities such as octopus, cuttlefish, stonefish, lobster, abalone, or sea cucumber, the prices that seafood exporters pay are well-known. One *amo* even posts the prices that the seafood exporter pays and the prices that she offers her *tauhan* and other fishers in the village.

### The middleperson-seafood exporter relationship

Export commodities such as octopus and cuttlefish end up with the seafood exporter based in Puerto Princesa City or Manila. Puerto Princesa City is a seafood exporter's paradise and the trade is dominated by the Chinese. As one travels along the national road going to the north of Palawan, the big signs saying that this or that establishment is buying seafood products such as lobster, octopus, cuttlefish, and sea cucumber are very noticeable. Many seafood exporters have their own facilities such as cold storage, packaging materials, holding tanks, and aerators to hold live fish, lobster and aquarium fish.

Seafood exporters specializing in octopus and cuttlefish have their own buyers in the fishing villages and fishers can only sell to these village buyers. In the case of live fish, lobster, and aquarium fish, the fishers or their wives can sell directly to the seafood exporter, unless there is a village buyer who has

# Aquaculture marketing

By **MB Surtida**

Aquaculture production is meaningless unless distributed and consumed. Most of the time, the technology generated addresses production, never mind distribution and consumption. Experts say that if production is to be increased, distribution “from the point of production to the point of consumption must complement the increase.” As fish production increases, marketing must be efficient to allow it to expand.

## General marketing channels

Manner and method of selling aquaculture products, however, is commodity and place specific. For example, in the Philippines, grouper is bought and sold differently from tilapia or milkfish, or catfish or seaweeds. In the same way, catfish in Zarraga, Iloilo is bought and sold differently from Pandi, Bulacan. Other countries have different systems and methods of marketing. Thus, any one description of a marketing channel, when very specific, would not describe the prevailing system of an entire place or practice. This article attempts to describe the general prevailing marketing channels that apply to most commodities and areas. A specific practice on a specific product based on interviews on pages 17 and 20 illustrates the general description.

In Iloilo City, each seller or producer transacts with 75 buyers and these “brokers” serve 33 buyers or retailers daily. The number of “brokers” or buyers may vary according to the distance of the outlet to the original sellers (usually fishing ports). These tiers of traders is necessary because of the physical distance of the producers and consumers. Among themselves, the sellers have a tacit understanding of how high or low their products would be sold, thus, a certain degree of control on price exists. In the same way, buyers have a method that is called whispered pricing where other buyers obtain their supply at an agreed price, usually, the lowest being preferred by the buyers and the highest preferred by the producers. This may be true for high production fish like milkfish and

*Fish from the farms are brought direct to fishports where wholesalers and retailers obtain stocks for distribution to other retailers and consumers*



*Fish at fishports are further sorted to suit individual needs of retailers and distributors*

tilapia. Credit tie-ups among buyers and intermediaries are common. A study said that these were brought about by the urgent need to dispose of the product immediately and the trader's need to maintain his business. For high value crops such as shrimp and grouper, buyers go direct to the farm and pay the producer either in cash or checks.

## Fry marketing channels

Fry marketing in the Philippines is good business where milkfish and shrimp aquaculture is dependent on wild fry

*Tilapia and milkfish are the commodities with the most number of retailers before consumers buy them resulting in small profit margins for retailers but high price for consumers*



*Throughout the Philippines, places such as this roadside market are closest to most consumers*



## The fish marketing system in Sri Lanka

In Sri Lanka, a fish trader is also a money lender. The producer are lent money without collateral, no explicit interest rate, and no repayment schedule. It is believed that in so doing, the trader pays the producer substantially lower than the prevailing market price.

Fish has to be disposed of immediately to make sure that it reaches the consumers in good quality. A considerable distance separates the consumer from the producer, thus, an intervention is necessary to link both players. This necessitates that the marketing system operates through intermediaries called fish assemblers, wholesalers, and retailers.

Fish assemblers obtain supplies of fish from the fishermen, the wholesalers buy from the fish assemblers, and the retailers buy from the wholesalers or in some cases, from fish assemblers. The marketing function is done through these three players. There are five types of assemblers: Type 1 deals with small fish and sells within the district; Type 2 deals with big fish but sells within the district; Type 3 sells only in Colombo; Type 4 deals with export such as shrimp and lobsters; and Type 5 are those that bring the fish to the interior places of the country. It is commonly believed that fish assemblers enslave fishermen. Although loans are said to be interest-free, the price of fish paid by assemblers to fishermen is lower compared to non-debtors. Thus, the assemblers are the prime source of finance of the fishermen/producer.

Fish supply is usually obtained by auction or through a pre-agreed arrangement between fishermen and assemblers, with the assemblers usually getting assurance of a regular supply with pre-agreed arrangement. Although methods employed by fish assemblers may vary slightly,

these two are the dominant modes of buying. Where the assemblers buy at negotiated prices, the producer usually has a dependency relationship with the assembler on a long-term basis. Sometimes, kinship relationship is also considered.

Aside from the private assemblers, the Colombo Fisheries Corporation (CFC) handles about 2% of fish assemblers' function in Sri Lanka. It has 53 purchasing centers in 13 fish-producing areas, and recently gave loans to fish producers but fish obtained through this method was low compared with those obtained by private assemblers.

Until fairly recently, the market saw new entrants to the fish industry. With the socio-economic changes taking place, a new kind of fish assembler has emerged -- one who sells fish in non-coastal areas and retailers who take fish to non-coastal areas in vans and motorcycles. There is also the entry of export products such as shrimp and lobster.

The continued expansion of the fish industry in Sri Lanka has brought about a fairly competitive system for the fish assembling and fish retailing markets, and possibly disequilibrium in profits by some assemblers and retailers. The study says that the Sri Lanka government can restructure marketing arrangements and transport of fish by vans instead of trains. The state can also provide daily market information from the main consumption centers to the production centers. -- MBS

*From the paper by S Fernando, 1985. The marketing system in the small-scale fishery of Sri Lanka: does the middlemen exploit the fisherman? IN: T Panayotou, ed. Small-scale fisheries in Asia: socioeconomic analysis and policy, IDRC-229e IDRC, 60 Queen Street, Ottawa, Canada*

catch. Although threatened by environmental issues and depleting supply, fry gathering up to the present time is still lucrative especially for coastal subsistence farmers. Culasi, Antique in Panay Island has been acknowledged in a study to be the richest fry ground in the Philippines. Thus, it follows that fry marketing is a thriving business in the area.

Fry gatherers collect fry from the shores while the concessionaires take care of moving the fry from the gatherers to fishfarms, and in some cases to other fry dealers. In most provinces, fry grounds are divided into zones. Each concessionaire, depending on the productivity of the area, is assigned a certain area upon which he may allow gathering of fry over which he has authority to buy.

Fry concessions are acquired either through bidding or through payment of a fixed municipal fee. Bidding is usually done in municipal halls or office of the municipal treasurer. The concession fee or fixed rate is paid for either in lump sum or arranged payment scheme. Some fees require 50% at bidding with the remaining to be paid for during the term of the concession while others pay only 5% and the remaining balance in installment during the term. A study on marketing stated that Iloilo and Negros Islands have the lowest concession fee.

Fry concessionaires may be individual or group as in a co-operative. They are usually operators of nursery ponds or fishponds while others are fish brokers. Other than fry gathering,

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Mr. Joaquin Vera-Cruz  
and his fishing boat, a  
typical offshore model  
in the Philippines



## A Filipino fisher and marketer

The key to successful marketing is to transport as many fish in the shortest time possible. So says Mr. Joaquin Vera Cruz, a fish dealer and owner of a commercial fishing boat (*F/B Cita*). Vera Cruz, a native of Guimbal, Iloilo, relates his experience in fishing and fish transport.

"The fishing boat is of a type locally called *kubkuban*," he says. "The boat is accompanied by light boats that carry nets (called catcher boats) and generators for the 500 watt light ("power" boat). The fishing boat can support a total of 40 persons onboard -- 31 fishers with the catcher boats and 3 persons each from the three (power) light boats. Diesel fuel is used in these boats; one night of fishing for 2-5 miles consumes 2 drums of fuel.

During the months of peak season, that is, from January to mid-May, the most common catch is bullet tuna (locally called *aloy*). Fish catch can reach to about 300 boxes, each box containing 30-35 kg of fish. Fishers can go fishing thrice in one night which is usually at 3, 6, and 8 in the morning.

The boxes of fish catch are iced to preserve freshness. One block of ice costs P130; and this is good for 6 boxes. As soon as the boat docks, as early as 5-6 in the morning, the fish are then transported thru land vehicle to the Iloilo Fishing Port. The cost of transportation is fixed at P30 per box. From this amount, fuel consumption and hauling labor is deducted and the remaining amount goes to the fish owner. The amount of P10 is paid as port entry. The fish is then sold to the broker. However, if the fishing boat lands between 7-8 in the morning, the fish is sold in nearby towns like Guimbal, San Joaquin, Miag-ao and Tigbauan.

Other varieties of fishes sold include yellowfin tuna (locally known as *panit*), mackerel or scad (*tamodios* or *galunggong*), oxeve scad (*mat-an*), and salmon (*ugayan*).

Vera Cruz fishes in the waters off southern Iloilo, Antique, some parts in Negros, and Guimaras. Vera Cruz concludes that income is very low nowadays because of high cost of fuel. -- E. Gasataya

most gatherers have other occupations like fishing, business (small *sari-sari* store), or other employment.

Fry gathering is a fulltime occupation during peak fry months. In Iloilo, fry gathering is done mostly in the morning, six days a week, while in other places, it lasts until the afternoon. Gathered fry are placed in basins on the shore, sorted and counted. In some places, counting is done while the concessionnaire or buyer is present. Usually, the concessionnaire store the fry to condition them or to wait for buyers for 2 to 30 days. Fry are kept either in earthen jars, pails or basins during storage and fed mashed egg yolk. Water is changed to reduce mortality. Other fry species that are gathered with the preferred fry are sold or thrown away.

If fry must be sold within the fry grounds, concessionnaires usually send collectors to gather caught fry. Concessionnaires usually provide containers such as plastic and pandan bags, and tying materials. If fry are to be transported, oxygen is also provided. Delivery of fry to buyers depend on previous agreement. Buyers from concessionnaires consist mainly of fishpond own-

ers, fry dealers, and pond operators within the provincial boundary. Fry gatherers are usually paid in cash.

In storage, milkfish fry mortality ranges 10-18% while for shrimp, 5-20%. In consideration of mortality, gatherers give extra fry (5-20%), the quantity depending perhaps on the relationship of the gatherer to the buyer. Buying and selling of milkfish fry is year-round while for shrimp in Panay and Negros, it is April to December.

### Conclusion

The above description of marketing channels in the Philippines shows a system of buying and selling to be traditional which is determined by the amount of aquaculture product produced. The traditional method applies more to small volumes for trading compared with the corporate kind of production volume. A study stated that "where the scale of fish marketing is small, the number of trading intermediaries tend to be large, specifically so where

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# fresh fish catch . com

By **MT Castanos**

There may be no less than 20 online fish markets on the internet. Most belong to companies in the western hemisphere and the continent-down-under. These fish markets offer a fresh catch restaurant experience and/or various landing-processing-storage facilities and brokerage services. Each site offers a unique aspect of the fish and shellfish industries.

## WHOLESALE IN MELBOURNE

**[www.chsmith.com.au](http://www.chsmith.com.au)**

The real Melbourne wholesale fish market has a long history -- beginnings in 1892! -- and now sits on a 4.6 ha government land grant. Their website contains a little of the fish trading action, and includes pricing (monthly price history, volume traded from 1993 onwards) and other information (recipes, photo gallery). The site can be searched by fish name or fish type for over 100 species found on Australian waters. The website also promotes fish as a healthy diet alternative (see box).

Although it links to fishing equipment suppliers and other online markets -- through the so-called "The Fishing Web Guide" -- the number of websites reviewed and rated in terms of speed, size, usefulness and interest is few at the moment.

## THE FISH MARKET-SEAFOOD RESTAURANT OF MARINA DEL REY

**[www.eatfish.com](http://www.eatfish.com)**

"Great service, low prices, great tasting seafood" quips this California restaurant. Their website has a recipe index, meal coupons and practical consumer tips in cooking and buying seafood. Take the Seafood Edibility Chart for instance. They post lists of fish/shellfish that can be interchanged in recipes. For example, if the recipe calls for a firm-textured, mild-flavored grouper, you are advised to substitute sea bass or snapper, and not catfish or sturgeon as these are moderately-flavored though still firm-textured.

Another interesting guide posted is "how much fish to buy" as follows --

- cooked crabmeat, lobster, shrimp, scallops, squid: about 1/4 to 1/3 lb per person
- whole or round fish: 3/4 to 1 lb per person
- dressed or clean fish: 1/2 to 3/4 lb per person
- fillets and steaks: 1/3 to 1/2 lb per person
- live lobsters: 1 to 2 lb per person
- crabs: 1 to 2 lb per person
- mussels: 12-15 pieces per person
- oysters: 6 to 12 pieces per person
- clams: 6-12 pieces (depending on size) per person

## ONLINE RETAIL

**[www.peconic.net/gosmans/market/](http://www.peconic.net/gosmans/market/)**

**<http://fish2you.com>**

Robert and Mary Gosman of New York said they were fish packers and "fish drummers" (or market agents) before they put up their seafood restaurant. They further said that the resto started out as a chowder, specializing in lobster rolls, and later expanding into wholesale lobster and fish, clothing and gourmet food shops, and tourist services. Entrepreneurship at its best!

The fish2you site on the other hand sells individual boneless fish fillets (tilapia, snapper, grouper, tuna, salmon; also kingcrab and shrimp). The products are searchable by species type, by category like salt- or freshwater selection, and by intended menu like for appetizers, entrees, and soups. They can also be ordered

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**[www.chsmith.com.au/fish-prices/health.html](http://www.chsmith.com.au/fish-prices/health.html)**

## Omega-3

An exciting study funded by the federal and (New South Wales) state government and carried out by the Institute of Respiratory Medicine in Sydney has shown the consumption of oily fish is associated with a reduced risk of asthma in childhood.

The report suggests that an increased consumption of oily fish may reduce the prevalence of asthma in children. The study found that the consumption of canned and processed fish was not associated with the reduced risk of asthma.

### ... and what's an oily fish?

Oily fish are fish that have an oil content greater than 2%. Fish oil contains the omega-3 fatty acids, which are thought to be responsible for the association found. Luckily for consumers, many of the fish with high levels of omega-3 are reasonably priced and readily available. Here's a few fishes containing high levels of omega-3:

atlantic salmon  
blue mackerel  
golden perch  
ocean trout  
rainbow trout  
sea mullet  
silver trevally  
tuna (southern, bluefin, yellowfin)

online (but of course!); and if you wish to be updated about new specials, you can be notified by email. Links include nautical gift shops (wish to buy a mini-light house?), wines, and caviar.

The site also includes a fun page on jokes. A sampling:

- *Where do fish wash?* In the river basin.
- *Which fish can perform operations?* A sturgeon.
- *Where do shellfish go to borrow money?* To the prawn broker.
- *If fish live on land, which country would they live in?* Finland.
- *What sits at the bottom of the sea and shivers?* A nervous wreck.
- *What did the boy octopus say to the girl octopus?* I want to hold your hand hand hand hand hand hand hand hand
- *Why are fish smarter than mice?* Because they live in schools.
- *Where do fish keep their money?* In the river bank.
- *What is the best way to communicate with a fish?* Drop it a line!
- *What did the fish say when he hit the wall?* Dam!

## BIG MOTHERSHIPS

[www.sea-world.com](http://www.sea-world.com)

[www.aquaculture.com](http://www.aquaculture.com)

If you truly want to view all the players in the world's fish market, including auxillary industries, these two big websites are the



*Just your ordinary fish market!*

Uogashi ([www.tsukiji.or.jp](http://www.tsukiji.or.jp)) -- is in Japanese and, unfortunately, lacks an English language option.

The aquaculture dotcom, on the other hand, is yet to be officially launched (February 1, 2001 is the target) but has 46 companies and 24 organizations listed already. It offers several news/features and discussion forums. There are 15 of the latter, including one on marketing. This forum has the heading "Internet will revolutionize aquaculture marketing." There is also a book center where the current bestseller is *Freshwater Aquaculture* by William McLarney. An aquaculture poll is placed on the right side, with the question "Do you think high tariffs in the US for products such as Chinese crawfish are appropriate?" Vote as you believe.

**TWO MORE WEBSITES ON** ➡ PAGE 12

## A VILLAGE'S ... PAGE 15

an aerator to keep fish alive for a certain period. For abalone, the village buyer in Aplaya is connected with a seafood exporter based in Manila who has two male workers in his employ in charge of shucking abalone and packing them for transport to Manila through air cargo.

As in the relationship between the fisherman and the *amo*, the middleperson is also expected to sell her products only to the seafood exporter with whom she is connected. As in the *amo-tauhan* relationship, the middleperson-seafood exporter relationship is meant to be beneficial to both parties.

## Middlepersons and Aplaya's incorporation into the world market economy

The men and women of Aplaya are active participants in the world market economy. This participation has brought in cash income

for the fishing households but ironically has not led to a better life for them. The crucial thing about this incorporation, however, is the way production is organized at the village level and the social relationships arising from it. The relationships through the middlepersons facilitate the orderly and efficient extraction of resources, oftentimes to the point of depletion. Interestingly, women are usually the conduits between the fishers and gatherers and seafood exporters. It may not be an exaggeration to say that the incorporation of Aplaya into the world market economy would not have happened without the intercession of the middlepersons. Small-scale fishing in Aplaya is being driven by the debt-relationship between middlepersons and fishers/gatherers.

## ACKNOWLEDGMENT

The author is grateful to the villagers of Aplaya for their warm reception and hospitality.



# Middlemen: the most maligned players in the fish distribution channel

By **AP Surtida**

Analysis of the fisheries market structure in the Philippines could be focused on: degree of concentration of sellers and buyers; product differentiation; and conditions of entry. It can also be classified as oligopolistic (Librero 1985), meaning, a market situation in which each of a limited number of producers is strong enough to influence the market, but not strong enough to disregard the reaction of his competitors. The oligopolistic structure is due to the multiple economic functions performed by traders and the vertically integrated operations of some brokers. The role of the traders must be seen within the light of indigenous free market cost of capital, risks borne, importance of social relationships in the traditional market setting and opportunity cost of replacing these functions (Torres et al. 1987).

The common practice among producers, whether in aquaculture or capture fisheries, is to concentrate on the production side of the industry and relegate the marketing to representatives or agents. This creates a niche in the fish distribution channel: the brokers or middlemen.

A broker is defined as an agent whose expertise is on selling or buying for his/her principal without having possession of or title to the goods. He earns his keep through a commission that is a percentage of the value of the goods bought or sold.

However, fish brokers at the Navotas Fish Landing and Market Authority (NAFILMA) and various fish markets across the country are not ordinary run-of-the mill brokers. Aside from receiving commission and representing their principals, they also have possession and physical control of the fish catch consigned to them. They have the power to agree on prices. In some cases, brokers have a dual role: they also engaged in production in aquaculture or capture fisheries.

According to a recent study (Salayo 2000), monopsonistic tendencies exist at the broker level, meaning, there is a market situation in which there is a single buyer for a given product or service from a large number of sellers.

An Asian Development Bank study (1993) said that fish marketing in the Philippines is not efficient and is characterized by:

- proportionately low return to producers
- a primordial role played by middlemen
- poor handling, preservation, and other post-market practices
- inadequate and inappropriately located marketing infrastructure; and
- lack of accurate market information

The same study also said that middlemen are the most maligned players in the marketing scenario. They are often associ-

ated with price and supply manipulation, but they do perform other distinct economic functions, including extension of credit, assuming risks of spoilage, and bridging time and space gaps between production and consumption.

The ADB study further describes middlemen as assemblers or brokers, and large fishing operators who are also into buying and wholesaling. Their commissions ranged from 5 to 7% in commercial selling. Their mark-ups at each stage of the marketing chain range from 10 to 50%. Thus, farm-gate prices are generally less than half of retail prices. Prices at the source are not, however, always identical with prices received by the fishermen, especially when the fishermen are hired help and are not boat-owners. In such cases, return to the fishermen is also 15% of the landed price.

The Librero (1985) study showed that brokers in Iloilo, Bacolod and Zamboanga are quite optimistic that factors such as goodwill, customer loyalty, or even capitalization and license acquisition were of no hindrance into their entry in the market. The only thing that fazed them was assurance of regular fish supply. But established brokers were given preference by both producers and fish buyers.

Where sellers are outnumbered by buyers, sellers can choose their methods of sale namely: by auction, contract sale or first-come-first-served basis. Terms of sale between producers-brokers, brokers-buyers, and among different buyers have their own dynamics. For example: **between producers and brokers** -- brokers are paid 5-7% commission on gross sales as producers' representative. Because fish are usually sold on credit, a broker uses his own capital to pay the suppliers promptly and fully and gives cash advances to maintain goodwill. Producers, on the other hand, sometimes extend 1-3 days credit to their brokers.

**Between brokers and buyers** -- brokers have the freedom to negotiate with any buyer. Generally, brokers sell their products on credit payable before next purchase. On a consignment basis however, the buyers pay their respective brokers at the end of the days' transactions or payments are remitted the following day. Transactions are either in cash or installment payment.

**Among different buyers** -- cash and carry is the usual practice, however, credit is also established with regular customers, selected friends, and relatives under exceptional cases.

In a more "up-close and personal" communication, we asked two producers/sellers about their experience with middlemen. One is a shrimp hatchery owner, and the other a mudcrab pond operator.

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Mr. Domingo Villanueva, 52, from Santa Barbara, Iloilo operates a mudcrab farm in Sapián, Capiz. He says that middlemen are an integral part and is very vital to the industry. They take care of problems in information, marketing access, transportation logistics, and finance, which he, as a mudcrab producer doesn't want to pay attention to because these aggravations would add to his problems. He gave this hypothetical example of a chain of middlemen and pricing, before it reaches the consumer -- farm gate price of mudcrab per kilo, P60; middleman A sells at P80, middleman B at P120, middleman C at P180, middleman D at P200. The retailer sells and the consumer pays P300.

Queried about the attributes of middlemen he wants to deal with, Villanueva enumerated the following virtues: honesty, capital capability, trustworthy, credible, knowledgeable, with good 'pakikisama' (smooth interpersonal relations), and a good track record.

The other informant, Ms. Angelita Tillo, a shrimp hatchery owner-proprietor in Tigbauan, Iloilo, has a similar view. Middlemen are valuable components in the industry. According to Tillo, middlemen have ample information regarding fry buyers in Bohol, Iligan, Masbate, Palawan and elsewhere, which she as a producer, has no access to. She sells her shrimp fry at 13 or 14 centavos to middlemen and the middlemen make their mark-ups which runs up to 20 centavos when it reaches the buyer. The deal is always on a cash basis between Tillo and her middlemen, because according to her, the biggest killer in the business is non-payment of delivery or bad debts. No checks either, because they could bounce and would lead to bankruptcy.

About the middlemen's attributes, Angie rattles off the following virtues: good track record, not an *estafador* (cheat), with good reputation in the business, pays good price, honest and reliable.

All the answers seem to confirm all past studies on market structure in the Philippines.

In a milkfish fry study in western Visayas (Nazareno et al 1979), it was noted that fry gatherers have four types of buyers: concessionaires (67%), dealers (9%), nursery ponds operators (7%), and fish pond operators (1.6%). Clearly, it shows that profit does not go directly to the pond operators, but to various middlemen.

Relationships between fry gatherers and concessionaires are often in close contact during the fry season, hence, amenities and other forms of assistance, including financial assistance, have been extended by the latter to the former (Librero 1976).

In a study of municipal fishermen in Camarines Sur (Piansay et al. 1979), five types of buyers were known: wholesalers (53%), retailers (35%), wholesalers-retailers (11%), and processors and consumers. On the basis of reported value of fish marketed to various outlets, it showed that fishermen stood to profit more in dealing directly with consumers (P4.95 per kilo) and processors (P4.60 per kilo). Retailers, wholesaler-retailers, and wholesalers relatively paid lower prices at P2.74, P2.42, and P2.35 per kilo respectively.

## Types of sellers and buyers in the Philippine fish market

*Sellers, producers or their representatives, may fall into the following types (Librero 1985):*

- Commercial fishing boat operators with a gross tonnage of at least 3 tons
- Municipal fishermen operating fishing boats of less than 3 tons
- Middlemen who operate carrier boats and buy fish from fishing boat operators at the fishing grounds to sell at landing areas
- Fishpond or fish pen operators producing milkfish or shrimp or both
- Truckers, who maybe producers or middlemen, who bring in fish catch from other places by truck

*Types of buyers according to characteristics and functions:*

- Wholesalers are merchants who buy fish, usually in fairly large quantities, either from brokers or producers, and sell them to other middlemen (but not to ultimate consumers)
- Retailers are middlemen who sell their fish purchases to the ultimate consumers, mostly in retail markets
- Wholesaler-retailers are middlemen who buy fish in fairly large quantities and sell them to other middlemen and also to the ultimate consumers
- Buyer-sellers are also wholesalers but are differentiated from them as operating within the confines of the fish-landing area
- Institutional buyers buying fish for consumption in such institutions as hospitals, restaurants, etc
- Processors buy in bulk for processing into salted dried fish, tinapa, fishmeal etc
- Exporters buy fish for export to foreign market
- Canners buy fish for canning and
- Final consumers buy fish for household consumption

Librero (1985) confirmed that the presence of middlemen, which constitutes a long chain in fish trading, is one of the major problems in the fish marketing system in the Philippines. The study said that middlemen tend to inflate marketing costs by as much as 200%. Other than that, fish quality also suffers because of the long marketing chain.

The other two problems mentioned in the study are: lack of adequate fish landing areas (at that time) including lack of ice plants and cold storage facilities; and inefficient collection and distribution of fish, which results in areas of fish surpluses such as southern Luzon and the Visayas, and areas of deficit such as northern Luzon and some provinces in Mindanao. However, in another study (Torres et al. 1987), it was found that the tiers of middlemen that handle the commodity is large because the number of people involved in the distribution of fish is large. This makes fish marketing appear as a crowded enterprise.



# Food safety through HACCP

By **RIY Adan**

Hazards and risks that may adversely affect the health of people are inherent in all human activities. Aquaculture is no exception to this general rule. As aquaculture assumes an expanding role in meeting consumer demand for fishery products, it is only natural that the quality and safety of its products come under the scrutiny of national and international organizations responsible for food safety. These products can be exposed to a range of hazards from the water to the table. Some of these hazards are natural to aquaculture's environment; others are introduced by humans.

Traditionally, industry and regulators have depended on spot-checks of manufacturing conditions and random sampling of final products to ensure safe food. This approach, however, tends to be reactive, rather than preventive.

The Hazard Analysis Critical Control Point or HACCP system is gaining momentum as the best approach to assuring the highest degree of food safety. The HACCP system, which was first outlined in 1971 in the USA, has now been widely accepted internationally. USFDA (United States Food and Drug Administration) made HACCP regulation mandatory by 1997 while the European Economic Communities (EEC) prescribed their requirements for fish products entering the European market in its Council Directives.

## What is HACCP?

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.

The HACCP approach is unique for every product and for every production unit: in each case, a detailed study of the fish farming methods, inputs and production conditions is required, and the sequential flow is necessary to identify hazards and the critical control points.

Another important feature of HACCP is that it provides the basis for clearly defining and modernizing the roles industry and government must play to ensure the safety of food. The government does not produce food. Thus, government action alone cannot make it safe. At the point of production and processing, only food companies have the capability and responsibility to make food safe. Maintaining food safety also requires responsible private action at each step of distribution, retail preparation and sale, and subsequent handling by consumers. The government's core regulatory role, which HACCP can facilitate, should be to verify that companies are meeting their responsibility. The government should define in law the companies' basic food safety obligation

and provide accountability for businesses to meet those standards through appropriate oversight and enforcement.

For successful implementation of a HACCP plan, a company must be strongly committed to the HACCP concept. A firm commitment to HACCP by top management provides company employees with a sense of the importance of producing safe food.

In the development of a HACCP plan, five preliminary tasks need to be accomplished before the application of the HACCP principles to a specific product and process.

- Assemble the HACCP team
- Describe the food and its distribution
- Describe the intended use and consumers of the food
- Develop a flow diagram which describes the process
- Verify the flow diagram

On the other hand, the seven principles of HACCP have been universally accepted by government agencies, trade associations, and the food industry around the world. These are:

**Analyze hazards.** Identify potential hazards associated with a food and measures to control it. The hazard could be biological, such as a microbe; chemical, such as a toxin; or physical, such as ground glass or metal fragments

**Identify critical control points.** These are points in a food's production—from its raw state through processing and shipping to consumption by the consumer—at which the potential hazard can be controlled or eliminated. Examples are cooking, cooling, packaging, and metal detection

**Establish preventive measures with critical limits for each control point.** For a cooked food, for example, this might include setting the minimum cooking temperature and time required to ensure the elimination of any harmful microbes

**Establish procedures to monitor the critical control points.** Such procedures might include determining how and by whom cooking time and temperature should be monitored

**Establish corrective actions to be taken when monitoring shows that a critical limit has not been met**—for example, reprocessing or disposing of food if the minimum cooking temperature is not met

**Establish procedures to verify that the system is working properly**—for example, testing time-and-temperature recording devices to verify that a cooking unit is working properly

**Establish effective record keeping to document the HACCP system.** This would include records of hazards and their control methods, the monitoring of safety requirements and ac

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# Seafood restaurants on the go

By **RIYAdan**

Iloilo is home to several seafood restaurants: read on and know the story behind the success of two of the best food houses in town.

## Breakthrough

What would be better than a combination of aquaculture and seafood restaurant business? This, in a nutshell, is what Raymundo Robles did – and he is now reaping the fruits of this great combination.

Robles was into *kapis* shell and dried fish business when he decided to put up Breakthrough – a seafood restaurant -- to augment the family's income. When *kapis* shell production started to decline, he decided to concentrate on Breakthrough.

The restaurant serves a variety of marine specialties from oysters, crabs, shrimps, prawns, lobsters, and various kinds of fish such as blue marlin, red snapper, tuna and milkfish. They are grilled, steamed, made into *sinigang* (sour soup), deep-fried or cooked with coconut oil. Other must-eats are scallops, nylon shells, *diwal*, and the mangrove clam *imbao*. Breakthrough was the first to offer crabmeat, red snapper and scallops here in Iloilo. They cater mostly to visitors coming from Manila and company dine-outs. Moreover, not only does Breakthrough offer great food, it also has a great view of the Iloilo Strait, the waters separating Panay and Guimaras islands.

At the start of their operation, they get their supply of shrimp, prawn, and *tangigue* mainly from the market. They have a supplier from Capiz and Negros for red snapper, scallops etc. Delivery is once a week, depending on supply and demand. Since seafood should not be stored longer – they limit storage up to three days only.



*A sampling of seafood at the Breakthrough restaurant owned by Mr. Robles (left)*



However, Robles later on encountered some problems on fish supply. He realized that it was such a big risk to depend exclusively on his supplier or the market.

“There are times the supplier fails to deliver or there is no fish available in the market – meaning we don’t have anything to offer to customers. The business would definitely fail if we solely depend on them.”

It was then that Robles

decided to venture into aquaculture.

“When a customer orders snapper and you can not provide him one – well, you lose one customer. And you know how it is in this business, a word of customer dissatisfaction travels fast.”

He put up fishponds in Trapiche, Oton mainly for red snapper, grouper, and lobster production. Most of the red snapper goes to the restaurant while the rest goes to the market.

“There is constant and heavy demand for red snapper. Now that we are into production, Breakthrough never runs out of it anymore.”

At this point, Robles is planning to venture into food processing of crabmeat. Crab, he says, is abundant and its supply is not erratic. He plans to get a bigger area to accommodate this new business.

## Tatoy's Seafood and Manokan

Tatoy's Seafood and Manokan is another story. What started as a 3-table food house in the 1960s is now one of the biggest restaurants in Iloilo – with sitting capacity of more than a thousand to date. In 1960s, Tatoy's opened every Sunday only. In 1970s, they opened Saturday and Sunday. It was only in 1980s that they started to serve daily. This monumental improvement is the result of hard work of a very humble man – Mr. Honorato Espinosa – better known as Tio Tatoy, owner and manager of the said establishment.

It was a case of “he fishes, she cooks.” Tio Tatoy is a fisherman at heart. He started fishing at the age of 18 and only stopped when his business was already booming. He knows what fish tastes best and he knows which fish is fresh. This, together with





*Tatoy Espinosa and his restaurant*

his wife's knack for cooking, gave birth to Tatoy's Seafood and Manokan. Tatoy's offers a variety of seafood from grouper, milkfish, prawns, crabs, blue marlin among others. It is also known for its grilled native chicken.

"Tatoy's is really a family business. I train my children on-hand on the running of the place from marketing, cooking, customer service, management, etc," said Tio Tatoy with pride.

He oversees the management and operation of the whole business – eight of his nine children are involved in the business; one put up his own restaurant -- Nes and Tats -- in another part of the city. He also maintains 100 support staff.

Tio Tatoy's gets his supply from the central market. They buy daily from the market and do not store their supply for more than 2 days. He maintains a small fishpond for milkfish in Dulonan, Arevalo. "This (the milkfish pond) serves only as a reserve, in case we run out of supply! Most of the time, I personally do the marketing. This is to ensure that we get only the best and the freshest. I can really say that my knowledge as a fisherman helped." ###

#### AQUACULTURE MARKETING ... PAGE 19

fish landings are at highly dispersed points far from consumers." Although technology for production is at hand, aquaculture products have hardly put a dent in the availability of fish supply. Per-



#### AN INVITATION

### Open ocean aquaculture symposium

*18-19 June 2001; New Brunswick, Canada*

To provide the ever-expanding global population with safe, consistent and high quality seafood, aquaculture development will face many new challenges in the next millenium. There is no doubt that with current population increases and shifts in human consumption towards seafood, wild fisheries will not be able to meet consumer demands. Current population shifts towards coastal areas will increase user conflicts and anthropogenic sources of pollution limiting coastal aquaculture production. As a result, open ocean aquaculture may be the only viable option for future seafood production to meet the desired consumer demand.

Thus, a symposium on taking open ocean aquaculture to a commercial reality will be held in June in Canada. It will hold sessions on marine policy, ocean engineering, ocean environmental, and candidate species / integrated open ocean aquaculture.

The symposium, actually the fourth in a series, is organized by the Mississippi-Alabama Sea Grant Consortium.

For more information, visit: [www-org.usm.edu/~ooa/ooa\\_iv.html](http://www-org.usm.edu/~ooa/ooa_iv.html)

haps if the distribution system is efficient and the consumers benefit from low prices and at the same time assuring traders of a decent income, then perhaps more demand can be created. But then again, growth of an industry is seldom determined by a single factor. Growth of the aquaculture industry would therefore necessitate a thorough knowledge of the total system of production and marketing, which at the present time is conceived of only to be about technology, supply and demand and buying and selling, and not as a basis for action or belief.

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tion taken to correct potential problems. Each of these principles must be backed by sound scientific knowledge: for example, published microbiological studies on time and temperature factors for controlling foodborne pathogens

#### How does HACCP influence importers?

While importers have always been responsible for compliance with FDA regulations that prevent the entry and commerce of adulterated foods, previous practice depended solely on regulatory surveillance. The new mandatory HACCP regulations include requirements for importers to become more proactive in ensuring the safety of the imported seafoods and aquaculture products. In addition to traditional import surveillance and periodic inspections, FDA will now require certain HACCP controls.

#### Who must comply?

**Importers** -- U.S. owners or consignee at the time of entry into the United States, or the U.S. agent or representative of the foreign owner at time of entry. Foreign processors will be influenced indirectly through requirements for U.S. importers to ensure their suppliers comply with HACCP programs equivalent to that for domestic processors

**Processors** -- firms either in the United States or in a foreign country, engaged in handling, storing, preparing, heading, eviscerating, shucking, freezing, changing into different market forms, manufacturing, preserving, packing, labeling, dockside unloading, or holding fish and fishery products

The products involved are: fresh or saltwater fish, crustaceans, all molluscs, alligators, frogs, aquatic turtles, jellyfish, sea cucumbers, sea urchins, other aquatic animal life except mammals and birds, and the roe from these animals, if intended for human consumption; fishery products with fish as the characterizing ingredient.

Products exempted from HACCP are those that are harvested or transported without processing. These include retail operations and practices such as heading, eviscerating, or freezing intended solely to prepare the involved products for holding onboard a harvest vessel. Note, harvesters and transporters can be influenced indirectly through a processors' product and shipping specifications as related to their HACCP Plans.

Over the last thirty years, HACCP has evolved from a simple method of ensuring food safety to an adaptable framework that can respond to change while identifying opportunities for improvement. The public health interest of the consuming public as always is placed first in its priority.

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The large number of middlemen seemed to be needed because of: (1) physical distance between producers and consumers; (2) variety of fish landed is such that the labor is needed for sorting, assembling, etc; (3) where the fish caught by large fishing vessels require bulk-breaking since no one trader can buy the whole lot especially in the Navotas fish landing; and (4) with processing, storage and transport activities, there is a need to introduce other intermediaries into the distribution system.

Therefore, it becomes extremely difficult to shorten the trade channels in addition to the fact that brokers have a hold on the fishermen in more ways than one.

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# AQUACULTURE ILLUSTRATED

## GIANT CLAM CULTURE

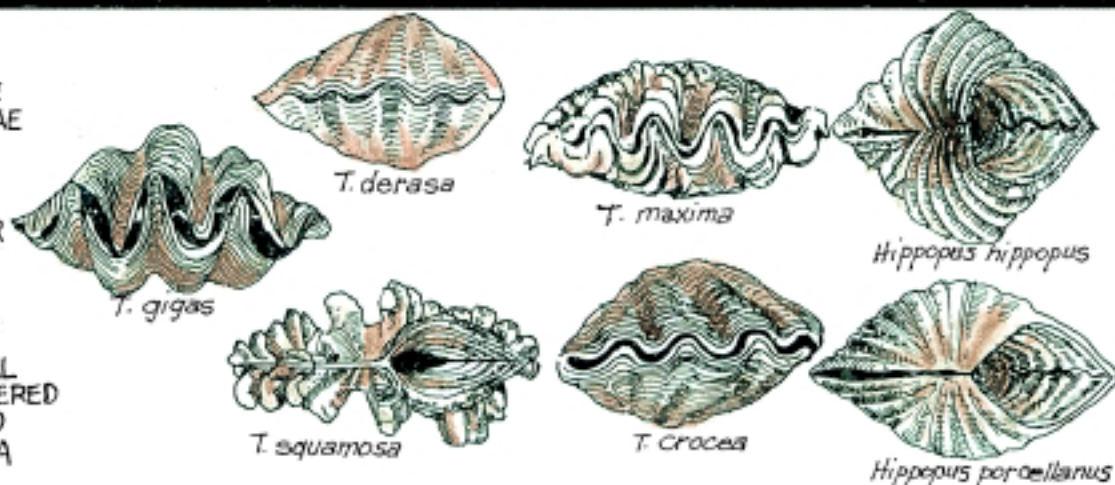
by a.p. surtida and  
e.t. ledesma



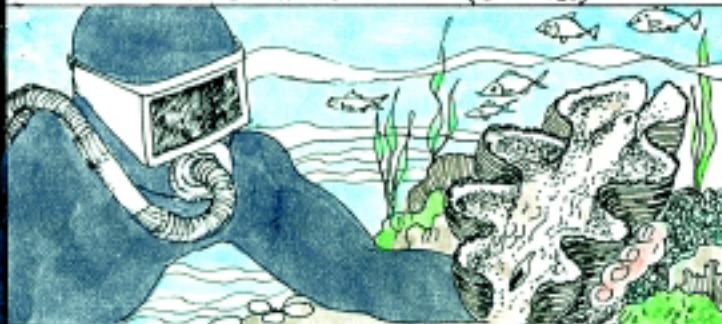
GIANT CLAMS ARE THE WORLD'S LARGEST BIVALVE. THE LARGEST SPECIES *T. GIGAS* CAN ATTAIN LENGTHS OF OVER 100cm. AND WEIGHT 200-500kgs. THEY REPRESENT A TRADITIONAL FOOD SOURCE FOR THE PEOPLE OF THE INDO-PACIFIC REGION... LOCALLY THEY ARE KNOWN AS KABIBE, TAKLOBO, MANGLOT OR SALIOT... IN RECENT YEARS, DEMAND FOR MEAT OR SHELLS, COUPLED WITH OVER EXPLOITATION, HAVE DECIMATED AND LOCALLY EXTERMINATED POPULATIONS OF SOME SPECIES...



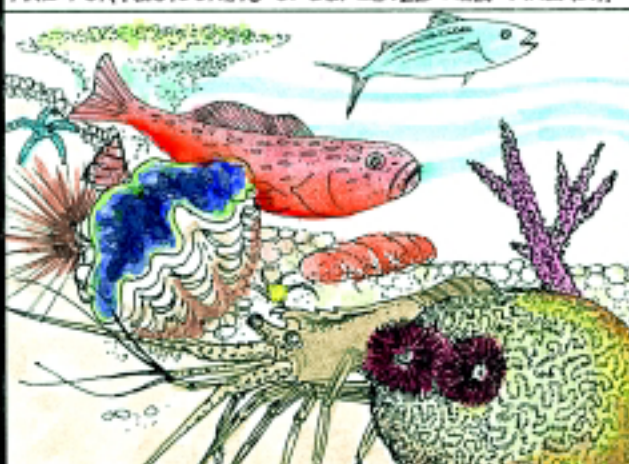
ALL THE SEVEN EXISTING SPECIES BELONGING TO THE FAMILY TRIDACNIDAE ARE FOUND IN PHILIPPINE WATERS. THEY ALSO APPEAR IN THE LIST OF ENDANGERED SPECIES OF THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FLORA AND FAUNA (CITES).



IN 1984 AN INTERNATIONAL COLLABORATIVE RESEARCH PROGRAM ON GIANT CLAMS WAS INITIATED BY THE INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT (ICLARM), WITH THE AUSTRALIAN CENTER FOR INTERNATIONAL AGRICULTURAL RESEARCH (ACIAR), PHILIPPINE COUNCIL FOR AGRICULTURAL RESOURCES RESEARCH DEVELOPMENT (PCARRD) AND THE MARINE SCIENCE INSTITUTE OF THE UNIVERSITY OF THE PHILIPPINES (UP-MSI).



THE OBJECTIVE OF THE PROGRAM IS TO DEVELOP CULTURE TECHNIQUES FOR GIANT CLAMS AS FOOD AND FOR RESTOCKING OF DEPLETED REEF AREAS...





## New publications



**Diseases of penaeid shrimps in the Philippines**, a 83-page second edition of a book first published in 1988. Of the 25 major diseases described, five are new. Entries have been

updated, and include causative agent, penaeid species and stages affected, gross signs, effects on host, preventive methods and treatment. *Price (includes postage):*

*P200 in the Philippines, US\$ 45 other countries.*



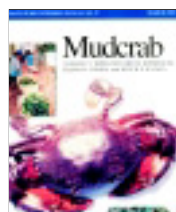
**Netcage culture of tilapia in dams and small farm reservoirs**, a 14-page manual that gives details on net cage

design and farm management. Profitability analysis is also included. *Price (includes postage):* P80 in the Philippines, US\$ 30 other countries.



**Ecology and farming of milkfish**, a 117-page monograph that

discusses the life history and ecology and various aspects of the farming industry in the Philippines. *Price (includes postage):* P300 in the Philippines, US\$50 other countries.



**Mudcrab**, a 32-page manual that gives a general overview of mudcrab species of commercial value and their grow-out monoculture in ponds; polyculture with milkfish; and fattening in ponds, mangroves, and cages. *Price (including postage):* P100 in the Philippines, US\$ 35 other countries.



**Mudcrab *Scylla* spp. production in brackish-water ponds**, a 14-page manual that covers the specifics of grow-out



operation. *Price (includes postage):* P80 in the Philippines, US\$ 30 other countries. **Pen culture of mudcrab in mangroves**, a 10-page manual that details the operation of net enclosures in mangroves for mudcrab culture. Includes site selection, net installation, stock management, and marketing. *Price (including postage):* P80 in the Philippines, US\$ 30 other countries.

**Grouper culture in ponds**, a 17-page manual discussing basic information about groupers and detailing brackishwater pond culture: sourcing fry and fingerlings, site selection, pond preparation, nursery operation, grow-out culture, harvest, and post-harvest. It also describes the economics of one grouper crop, marketing and transport techniques and diseases. *Price (including postage):* P80 in the Philippines, US\$ 30 other countries.

**Grouper culture in floating net cages**, a 10-page manual that details grow-out culture. *Price (includes postage):* P80 in the Philippines, US\$ 30 other countries.

**The modular method: milkfish pond culture**, an 18-page manual that describes a better way of raising milkfish in brackishwater ponds. The modular method is an improvement of the traditional extensive method. *Price (including postage):* P80 in the Philippines, US\$ 30 other countries.



**Promoting appropriate aquaculture technology for more fish in South-east Asia**, a 24-page report that discusses AQD's technology verification trials on (1) milkfish hatchery, pond culture using hatchery-raised fry, and polyculture of milkfish and seaweeds; (2) the use of environment-friendly schemes in tiger shrimp culture; (3) mudcrab culture in ponds and net enclosures in mangroves; (4) cage culture of hybrid tilapia; (5) catfish hatchery technology; and (6) oyster and mussel culture in rafts. *This report is free upon request.*

**1998 Highlights**, a 31-page report on AQD's research and development activities for 1998. A special insert on AQD's 25th year anniversary celebration is included, describing the organization's contributions to the aquaculture industry in the Philippines and other Southeast Asian countries. What's new for 1998 is AQD's thrust on mangrove-friendly aquaculture; preliminary results are presented. *This report is free upon request.*



**1999 Highlights**, a 32-page report of AQD's 1999 activities. It highlights AQD's collaborative projects with the private sector, and three international symposia that AQD hosted.

**Aquaculture, volume 164**, 374 pages. A special issue of the Elsevier journal that contains the papers presented at the *Second international conference on the culture of penaeid prawns and shrimps* held 13-17 May 1996 at Iloilo City, Philippines. This volume is guest-edited by AQD researchers ET Quintio and JH Primavera. *Price: P600 in the Philippines or US\$30 other countries.*



**Milkfish breeding and hatchery fry production**. Summarizes the integrated milkfish broodstock and hatchery operation technology developed by AQD.

**Milkfish breeding and hatchery technology at SEAFDEC/AQD**. Describes the techniques already adopted by the private sector: broodstock management, broodstock diet, commercial fry production, live transport, and larval diet. A list of AQD research publications on milkfish is included.

**The commercialization of SEAFDEC/AQD's milkfish fry production technology**. Illustrates AQD's newest hatchery facility -- the Integrated Fish Broodstock and Hatchery Demonstration Complex -- and the extension program that go with it -- Accelerated Transfer of Milkfish Fry Production Technology.



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**R&D: Abalone seed production and culture.** Details the research conducted at AQD for the tropical abalone *Haliotis asinina*. AQD has developed the rudiments of a hatchery protocol.

**Seed production of the native catfish *Clarias macrocephalus*.** Describes SEAFDEC/AQD's work on artificially propagating the catfish.

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